Instruction Sheet
for the PASCO
Model CI-6526

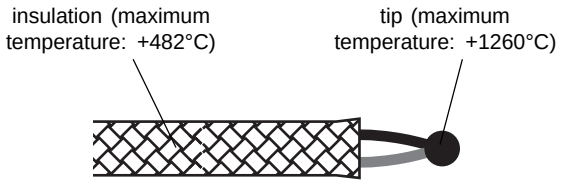
Type K Temperature Sensor

Introduction

The PASCO Model CI-6526 Type-K Thermocouple Temperature Sensor is designed to be used with a PASCO CI computer interface or a PASPORT USB interface with an Analog Adapter (PS-2158). A thermocouple works because junctions between dissimilar metals or alloys in an electrical circuit give rise to an electromotive force or voltage if they are at different temperatures. This type of thermocouple is made from a chromel and alumel wire junction.

Range

The tip of the 003-05590 Type-K Thermocouple Probe can withstand temperatures between -180°C and +1260°C. However, the insulation material that covers all but the tip of the sensor has a maximum temperature of +482°C. You can use the sensor to measure high temperatures such as those in a candle flame if you keep the insulated portion of the sensor out of the flame.



Temperature Range of 003-05590 Type-K Thermocouple Probe

The thermocouple characteristics are fairly linear from zero degrees Celsius up to the maximum temperature with an error less than 3°C ± 3% of the reading over the full range. Note that the error becomes larger below zero degrees Celsius. The Type-K Thermocouple can be used in water and mild chemical solutions; but it is well suited for dry measurements.

The sensor consists of the Type-K probe (Model PS-2155) and the sensor electronics box. The sensor box has a socket made from chromel and alumel that is mounted very close to the AD595 integrated circuit (IC). The IC provides the cold junction compensation as long as the IC temperature is equal to the junction temperature made by the socket and copper connections. The overall output voltage-to-temperature ratio is 10 milliVolts per degree Celsius. The output voltage range is -2.000 (at -200°C) to +10.000 Volts (at +1,000°C).

Additional Equipment Needed

- Computer Interface such as a PASCO CI interface or a PASPORT USB interface with an Analog Adapter (PS-2158).

Optional Equipment

- The sensor box accepts any Type-K thermocouple, such as the CI-6536 High Temperature Type-K Thermocouple Probe. The High Temperature Type-K Thermocouple Probe is housed in a 30.5 cm (12”) inconel metal cover (maximum temperature = +1148°C). Therefore, it can be used in an open flame or for other high temperature measurements.

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10101 Foothills Blvd. • Roseville, CA 95747-7100
Phone (916) 786-3800 • FAX (916) 786-8905 • www.pasco.com

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Operation

Connecting and Using the Sensor

Attach the probe's two prong connector to the sensor box at the port marked TYPE K THERMOCOUPLE PROBE INPUT. The two prong connector can go into the port only one way because one of the prongs is wider than the other. Connect the 8-pin DIN plug from the sensor box to Analog Channel A, B, or C on the computer interface box.

Touch the bare wire end of the sensor to the object to be measured or place the sensor end into the solution to be measured. To prevent damage to the sensor or the insulating material, do not put the insulated part of the sensor in a flame or put the insulation in contact with a heat source above +482°C.

➤ **NOTE:** IF YOU NEED TO MEASURE A TEMPERATURE HIGHER THAN +400 °C, USE THE CI-6536 HIGH TEMPERATURE TYPE-K THERMOCOUPLE PROBE. (See the PASCO catalog for more information.)

Using the Sensor in Mild Chemical Solutions

The Type-K Thermocouple is designed to be used in water and mild chemical solutions when measuring the temperature of a liquid. The bare wire end of the thermocouple has been tested for several minutes in the following chemicals without damage:

acetone	sodium hydroxide (lye)
household bleach	ethylene glycol butyl ether
isopropyl alcohol	ethylene glycol (antifreeze)
naphtha	sulfuric acid (battery acid)
vinegar	glacial acetic acid
paradichlorobenzene	water

• Carefully rinse off any chemicals after each use.

Using the optional Teflon Sensor Cover

A package of ten Teflon Sensor Covers is available from PASCO (part number CI-6549). See the PASCO catalog for more information.

Use the optional Teflon FEP sensor cover when the thermocouple probe must be placed in strong chemical solutions that may damage the probe.

Calibrating the Sensor

The sensor is designed to produce 0.003 V ± 0.005 V at 0 °C and 10 milliVolts per degree C. Therefore, the sensor does not need to be calibrated. Instead, the output voltage can be converted directly into a temperature. For example, an output voltage of 1.234 Volts equals a temperature of 123.4 °C.

However, you can calibrate the sensor using a two-point calibration process.

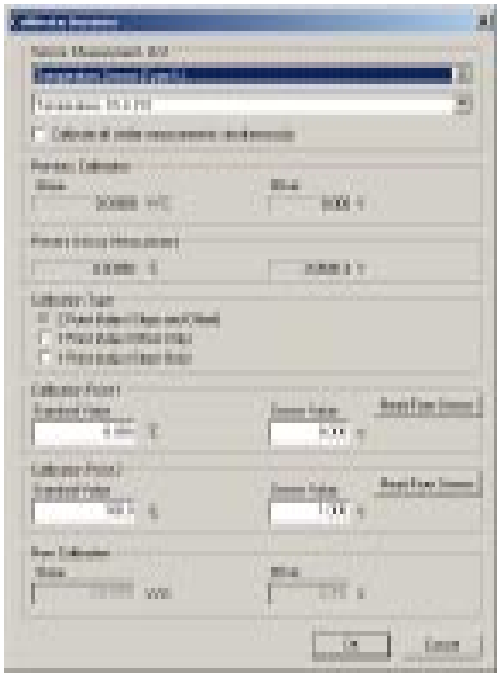
To calibrate the sensor you will need an accurate thermometer, ice water (0 °C), and boiling water (100 °C).

Calibrating the Sensor Using *DataStudio*

Assume for this example that the Type-K Thermocouple Temperature Sensor is connected to Analog Channel A of the interface and that you do not have any other sensors connected to the interface.

Start the *DataStudio* program. Select "Setup" from the DataStudio toolbar. The interface and sensor should appear in the setup window.

Select "Calibrate Sensors…" from the Experiment Setup toolbar. Be sure that "2 point (Adjust Slope and Offset)" is selected under "Calibration Type".



Calibration Point #1: Place the bare wire end of the thermocouple in the ice water. Also put the thermometer in the ice water. The monitor screen will show the voltage value produced by the sensor. When the thermometer reading is almost zero, enter the reading in the "Standard Value" box for Calibration Point 1, then click the "Read From Sensor" button for Calibration Point 1.

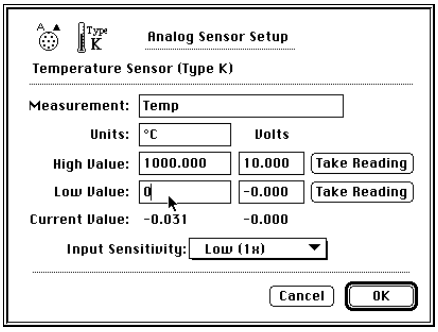
Calibration Point #2: Place the sensor and thermometer in boiling water. The monitor screen will show the new voltage produced by the sensor. When the ther-

mometer reading reaches a peak, enter the reading in the "Standard Value" box for Calibration Point 2, then click the "Read From Sensor" button for Calibration Point 2. Cilck "OK" at the bottom of the calibratiion screen and close the Experiment Setup window.

You can save your calibration as a *DataStudio* document by selecting "Save As…" from the File menu.

Calibrating the Sensor Using *Science Workshop*

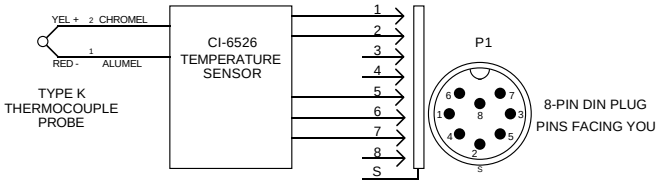
Start the *Science Workshop* program. Click-and-drag the analog sensor plug icon to Analog Channel A. Select "Temperature Sensor (Type-K)" from the list of analog sensors.



Calibration Point #1: Place the sensor and thermometer in the ice water. In the Experiment Setup window, double-click on the Type-K sensor icon to open the Analog Sensor Setup dialog box.

The dialog box will show the "Current Value" of the voltage produced by the Type-K sensor. When the voltage value is almost zero, click on the bottom "Take Reading" button. Enter the thermometer reading in the box labeled "Low Value:".

Calibration Point #2: Place the sensor and thermometer in the boiling water. The "Current Value" will show the new voltage produced by the sensor. When the voltage value reaches a peak, click on the top "Take Reading" button. Enter the thermometer reading in the box labeled "High Value:".



Schematic Diagram

You can save your calibration as a *Science Workshop* document by selecting "Save As…" from the File menu.

Limited Warranty

PASCO scientific warrants this product to be free from defects in materials and workmanship for a period of one year from the date of shipment to the customer. PASCO will repair or replace, at its option, any part of the product which is deemed to be defective in material or workmanship. This warranty does not cover damage to the product caused by abuse or improper use. Determination of whether a product failure is the result of a manufacturing defect or improper use by the customer shall be made solely by PASCO scientific. Responsibility for the return of equipment for warranty repair belongs to the customer. Equipment must be properly packed to prevent damage and shipped postage or freight prepaid. (Damage caused by improper packing of the equipment for return shipment will not be covered by the warranty.) Shipping costs for returning the equipment, after repair, will be paid by PASCO scientific.

Equipment Return

Should this product have to be returned to PASCO scientific, for whatever reason, notify PASCO scientific by letter or phone BEFORE returning the product. Upon notification, the return authorization and shipping instructions will be promptly issued.

➤ **NOTE:** NO EQUIPMENT WILL BE ACCEPTED FOR RETURN WITHOUT AN AUTHORIZATION.

When returning equipment for repair, the units must be packed properly. Carriers will not accept responsibility for damage caused by improper packing. To be certain the unit will not be damaged in shipment, observe the following rules:

① The carton must be strong enough for the item shipped.

② Make certain there is at least two inches of packing material between any point on the apparatus and the inside walls of the carton.

③ Make certain that the packing material can not shift in the box, or become compressed, thus letting the instrument come in contact with the edge of the box.